ToupTek Astro AAF User Manual

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1 Introduction and Description

1.1 Introduction and Description

Congratulations, and thank you for purchasing our AAF product!

The AAF (Astro Automatic Focuser) is an electric focusing system developed by ToupTek Astro. This manual will guide you through the usage and setup of the AAF. Please take the time to read it thoroughly.

If you have any questions, feel free to contact us through the following channels:www.touptek-astro.com

ToupTek Astro wishes for AAF to become your trusted partner in astronomical observations, providing convenience for your explorations. Should you encounter any issues or require assistance, our customer support team is always ready to help. We wish you success in your astrophotography endeavors.

1.2 Product Description

The AAF is available in two colors:

1. Solid Black
2. Black with a Blue Center Shell

The device features a full-metal casing with a finely textured matte finish, highlighting its professional quality. The body design incorporates visual elements that symbolize precise rotation control. Each segment of the circular fan blades reflects the AAF's exceptional focusing accuracy.

1.3 Specifications

Parameter	Details
Casing Material	Full-metal construction
Motor Type	40mm stepper motor
Step Angle	7.5° (full step, 48 steps/rev)
Torque	1.6 N·M
Maximum Load	6 KG
Power/Data Interface	USB 2.0 Type-C
Accessory Ports	3.5mm port (for sensor/controller)

Notes:

- The AAF can be powered directly via the USB 2.0 Type-C interface.
- The same interface supports data transmission and is compatible with ASCOM protocol,making it suitable for various deep-sky and planetary imaging software, such as NINA and Sharpcap.

1.4 Supported Models

The AAF is designed to support a wide range of focusing mounts with two optional

mounting plates. Supported models include, but are not limited to:

- Synta: Newtonian Reflectors, Black Diamond Series, DOB Series, Mak-Newt Mounts
- SharpStar: All series
- Yuzhong: All series
- Other International Brands:TS Optics Refractor Focusers, Astro Tech Focusers, Feather Touch Focusers

2 Structural Dimensions

2.1 AAF Dimensions

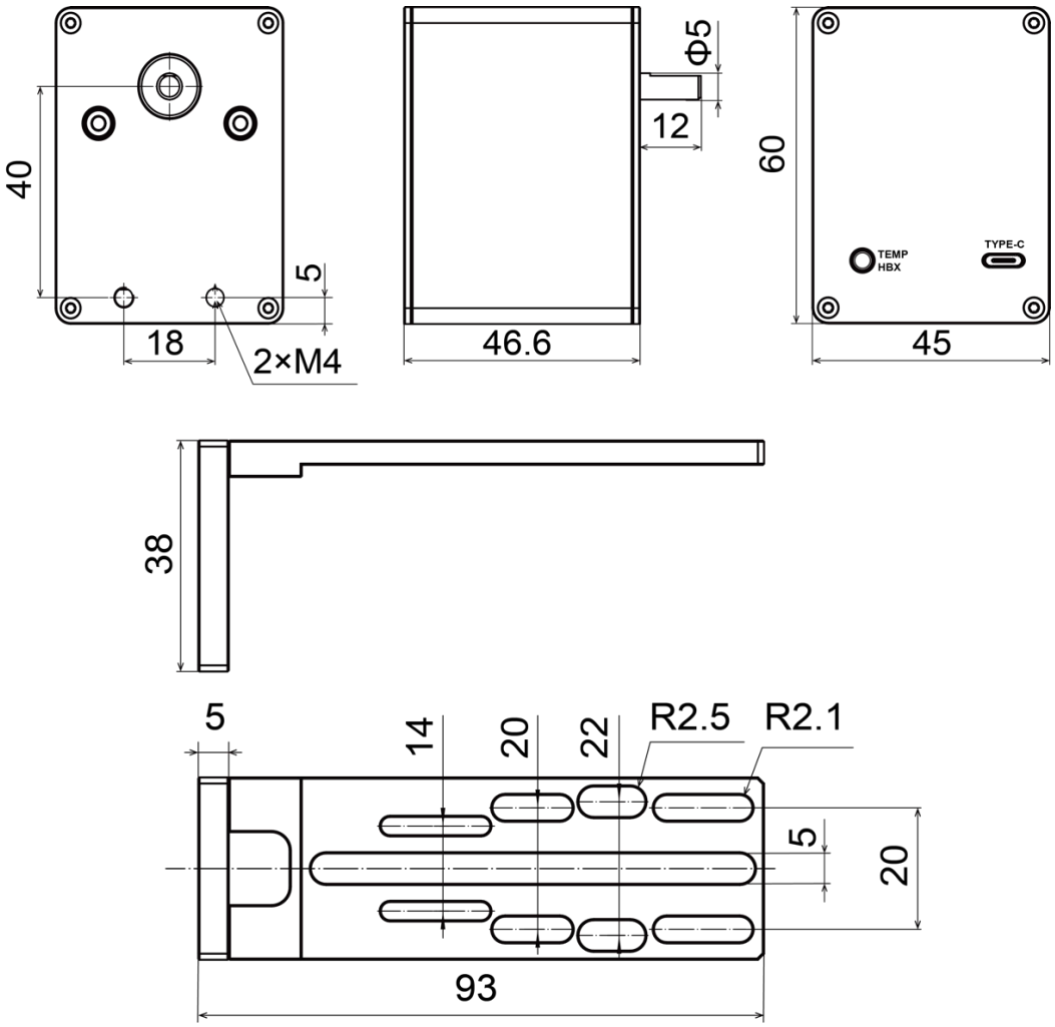


Figure 2-1 AAF Dimensions

3 Package Contents

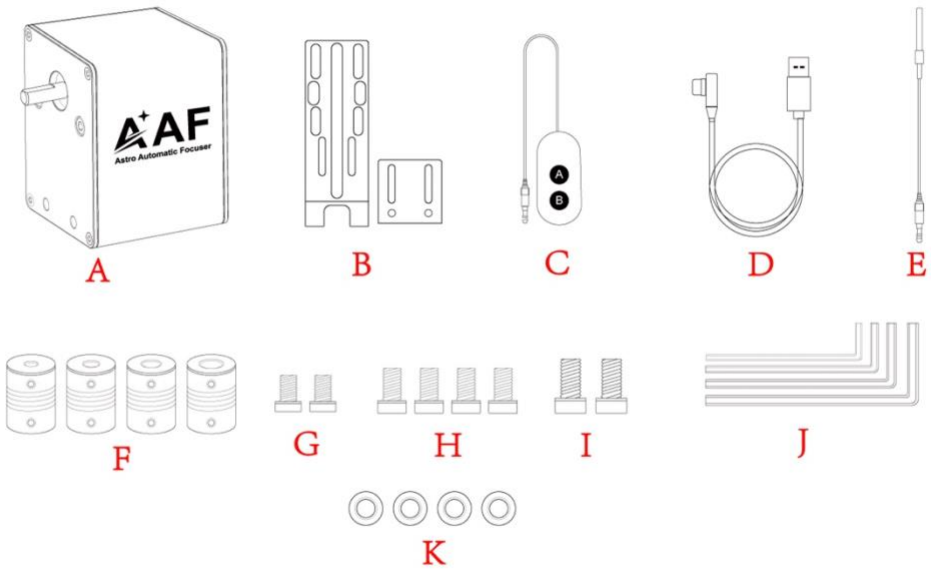


Figure 3-1 AAF Packaging Inventory Schematic Diagram

The AAF package includes the following standard accessories. Please ensure all items are present before installation:

Item	Quantity	Description
A. AAF Main Unit	**1**	The core component of the focusing system
B. Standard Mounting Plate	**1**	Used to secure the AAF to the telescope's focusing mount
C. Hand Controller	**1**	Enables manual fine adjustments for precise focusing
D. USB-C Cable	**1**	1m braided cable for power and data transfer
E. Temperature Sensor	**1**	0.1m cable for monitoring ambient temperature when connected
F. Elastic Couplings	**4**	19mm outer diameter, 25mm length (sizes: 5-4mm, 5-5mm, etc.)
G. M3 Screws	**2**	For mounting and securing components
H. M4 Screws	**2**	For assembly
I. M5 Screws	**2**	For specific mounting needs

Note: If any item is missing or damaged, please contact customer support immediately.

4 Precautions

Using AAF for Manual/Automatic Focusing

Manual Focusing Method

You can use the AAF hand controller or connect the device to compatible imaging software for manual focusing.

Hand Controller Operation:

Connect the hand controller to the AAF's 3.5mm multifunction port to enable precise manual focusing adjustments.

Software Configuration:

Beginners are advised to practice manual focusing during the daytime by aligning the telescope with a distant stationary object. Record the absolute step count once focus is achieved. At night, you can quickly return to the previously recorded focus position to begin observing or imaging without delay.

Setting Software Backlash Compensation

To improve focusing accuracy, configure backlash compensation in the imaging software. This can be easily done by accessing the device settings in NINA or Sharpcap and adjusting the corresponding options.

4.1 Precautions

1. The AAF features a high-torque motor. During initial use, it is recommended to set the zero position and maximum step count to prevent damage to the focusing mount.

2. **For standard focusing mounts**:

   - Set the zero position to the fully retracted state of the focusing mount.
   - Set the maximum step count to a value equal to or less than the full travel range of the focusing mount.

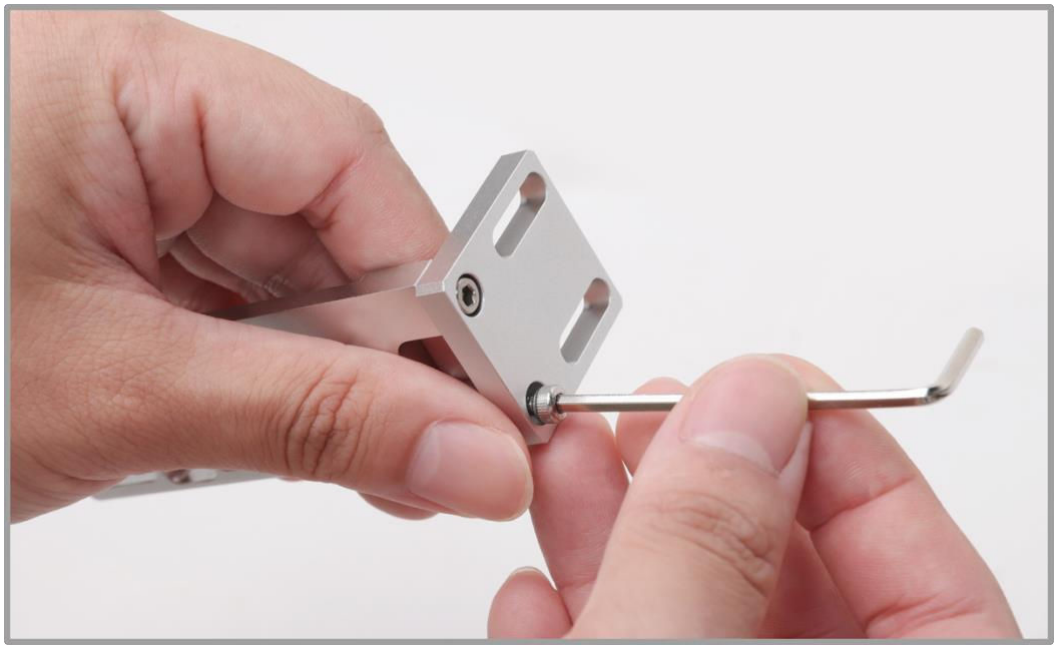
3. **For internal focusing telescopes such as Schmidt-Cassegrain (SCT) and Maksutov-Cassegrain telescopes**:
   - Set the zero position near the primary focus point.
   - Set the maximum step count to a value equal to or less than the full travel range of the focusing mount.

4.2 Installation Steps

Follow these steps to install the AAF on your telescope:

4.2.1 Installation Steps

Ensure that all items in the package are present. Use the provided M3 screws to assemble the standard mounting plate.



4.2.2 Check Accessories

Detach the focusing knob from your telescope to prepare for the installation of the AAF.



4.2.3 Install the Elastic Coupling

Select the elastic coupling that fits your telescope model and attach it securely.



4.2.4 Attach the AAF Unit

Use the M4 or M5 screws to fix the AAF main unit to the elastic coupling. Ensure it is firmly secured without any wobbling.



4.2.5 Install the Standard Mounting Plate

Fix the assembled standard mounting plate to the focusing mount using M4 screws. Then, connect the plate to the AAF main unit. Check all components for stability after installation.



4.2.6 Connect Data and Control Cables

Connect the following cables based on your requirements:

USB Data Cable: Provides power and data transmission.

Temperature Sensor: Monitors environmental temperature to improve focusing precision (optional).

Hand Controller: Allows manual focusing and enhances operational flexibility.

Note: After completing the installation, ensure all components are firmly secured and that ensure cables are properly routed and not under tension or compression.



4.3 ASCOM Driver Installation and Setup

4.3.1 Installing the ASCOM Driver

If you intend to use third-party imaging software, the ASCOM driver must be installed.

Download link: ASCOM Driver Download

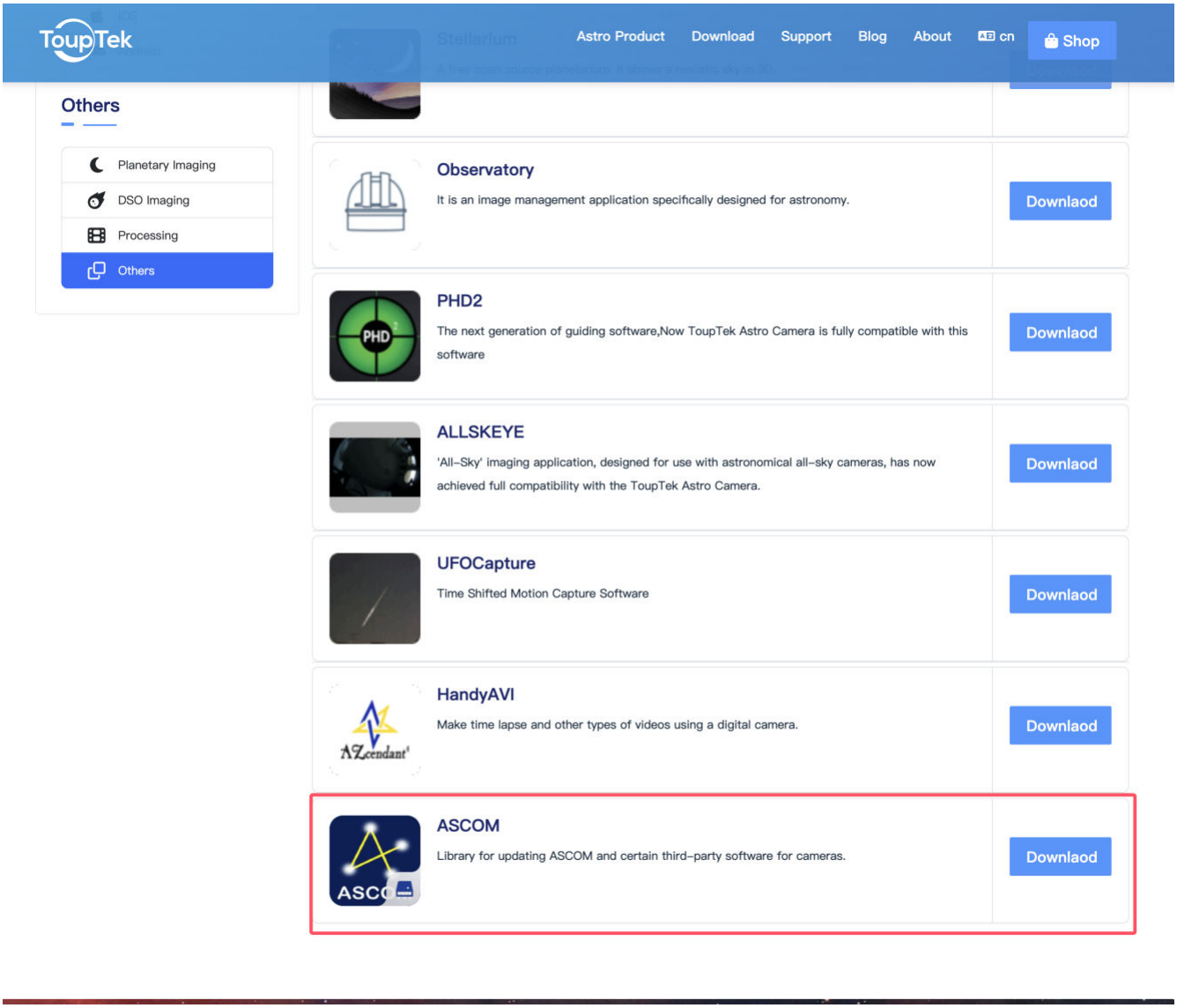


Figure 4-1 ToupTek ASCOM Driver Download Interface.

4.3.2 Updating ToupTek Device Drivers

After installing the ASCOM driver, download and update the full suite of ToupTek device drivers.

These drivers allow AAF and other ToupTek devices to function seamlessly with supported software.

Driver update link: ToupTek Device Drivers

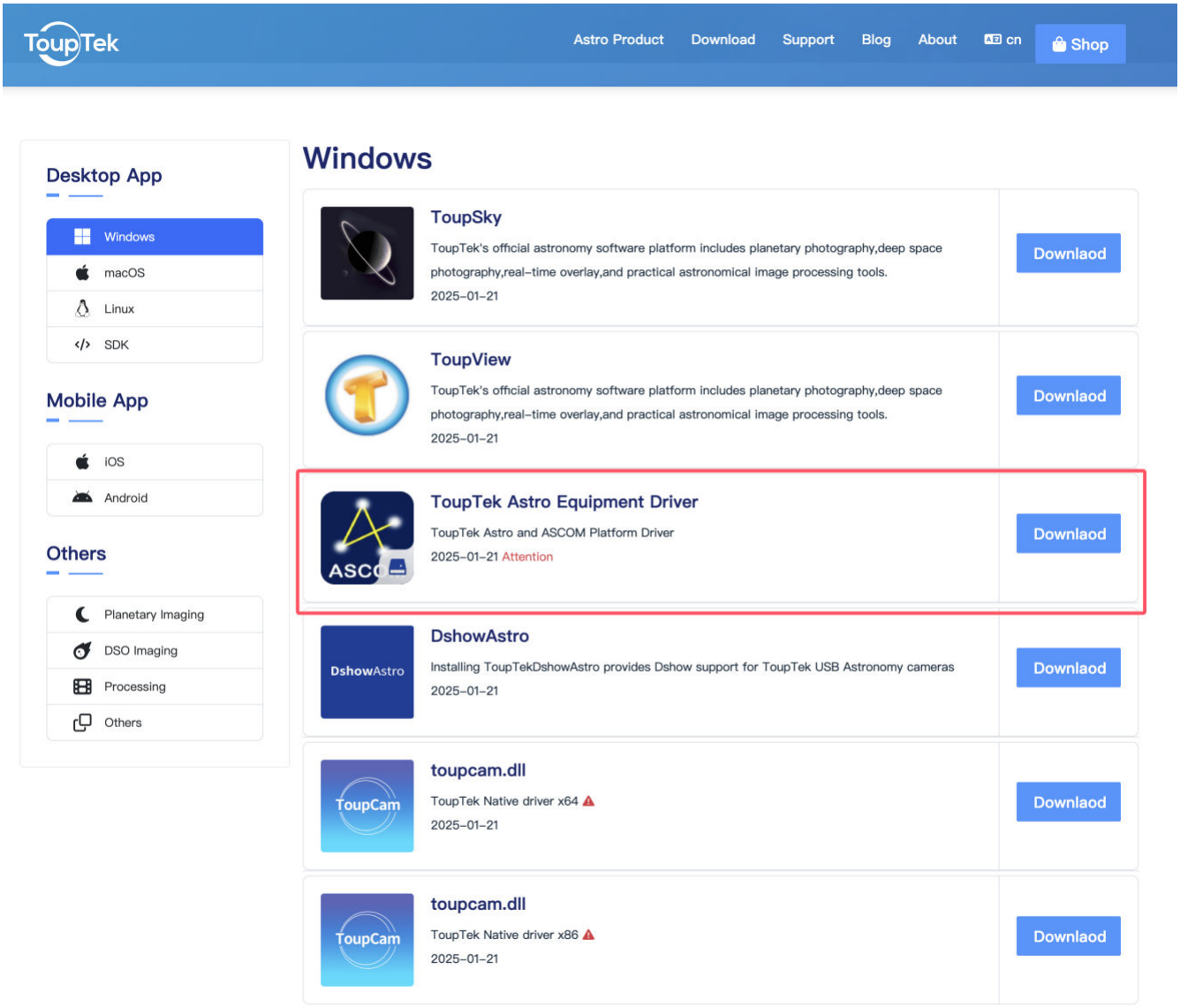


Figure 4-2 ToupTek Device Driver Update Program Interface.

4.3.3 Setting Up the AAF

In NINA's **"Focuser"** interface, select **"ASCOM ToupTek AAF"**, then click the settings button on the right to configure related options.

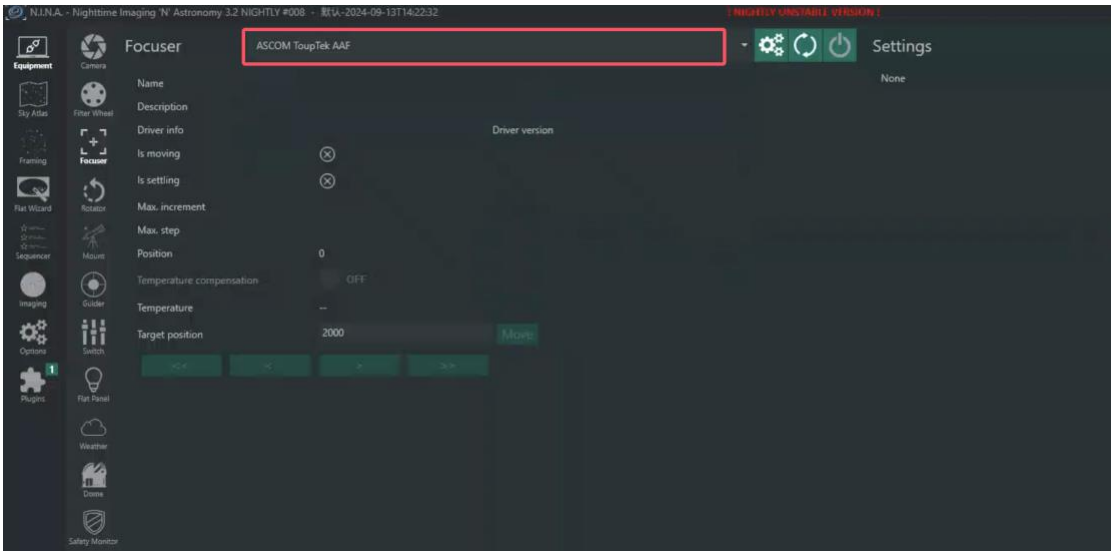


Figure 4-3 NINA Autofocus Settings Interface

Configuration Options

1. **Maximum Step Count**:

The maximum step count can be set to 65,000. If a larger step count is required, you can use the hand controller for adjustments, as it has no step limit.

For remote observatories, you can incrementally set the starting position and adjust multiple times to achieve the required range.

Recommendation: Users of remote observatories should use the temperature sensor to obtain the most accurate temperature readings, avoiding potential optical element distortion caused by temperature fluctuations.

2. **Reverse Movement Setting**:

Enable this option to allow the AAF to reverse its movement direction.

3. **Buzzer**:

Enable this option to activate a buzzer sound whenever the AAF moves. The buzzer emits a beep with each operation. You can enable or disable it as needed.

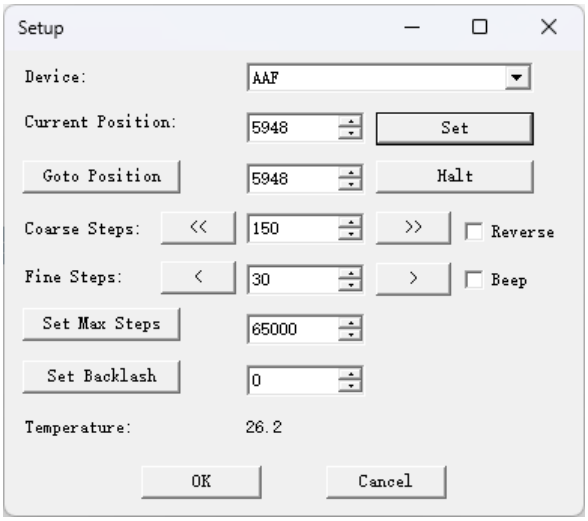


Figure 4-4 AAF Settings Interface in NINA

4.4 Autofocus

This section explains how to use the AAF for autofocus with two popular imaging software: **NINA** and **Sequence Generator Pro (SGP)**.

4.4.1 NINA Autofocus Guide

This section provides step-by-step instructions for using the AAF with NINA's autofocus function.

1. Preparation

Before using the NINA autofocus feature, ensure the following preparations are completed:

- **Device Connection**: Properly connect the camera, AAF, and any additional necessary devices. Enable the equatorial mount's tracking function.
- **Initial Focus Adjustment**: Manually adjust the telescope to bring it close to focus, ensuring that star images are reasonably clear.

2. Configuring Autofocus Parameters

To configure autofocus parameters, follow these steps:

1.Open the autofocus settings menu in NINA: Navigate to **"Options → Equipment → Focuser"**.

2.Load the AAF device and proceed with parameter configuration. The interface is shown in Figure 4-5

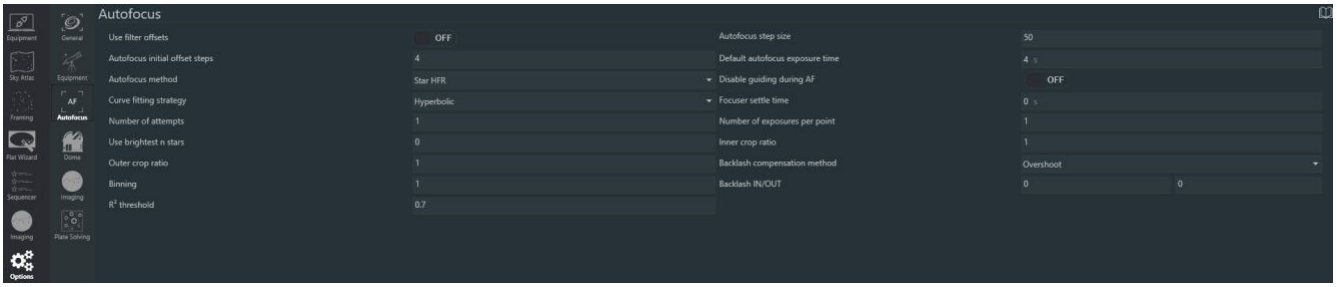


Figure 4-5 Autofocus settings interface in NINA

Key Parameters:

Autofocus Step Size:Defines the step size between consecutive focus points. It is recommended to adjust this value based on your specific equipment characteristics.

Autofocus Initial Offset Steps:Controls the number of data points on the focus curve. Too few points can reduce accuracy, while too many points may lead to autofocus failure.

Autofocus Method:For deep-sky imaging, select **"Star HFR"** as the autofocus method.

Curve Fitting Strategy:Choose the algorithm for fitting the focus curve. **"Hyperbolic"** is the recommended option for astrophotography.

Backlash Compensation Method:Set this to **"Overshoot"**. Note that you must disconnect the AAF device to modify this parameter.

Backlash IN/OUT:When using the **"Overshoot"** method, input a backlash compensation value for only one direction (either IN or OUT), while the other direction is set to **0**. The compensation value should be slightly larger than the measured backlash.

3. Manually Starting Autofocus

To initiate autofocus manually:

- Go to the **"Imaging"** tab.
- Click the **"AF"** button at the top right to switch to the **"Auto Focus"** page.

- Ensure the AAF and camera are connected, then click **"Start Auto Focus"** to begin.

The interface is shown in Figure 4-6.

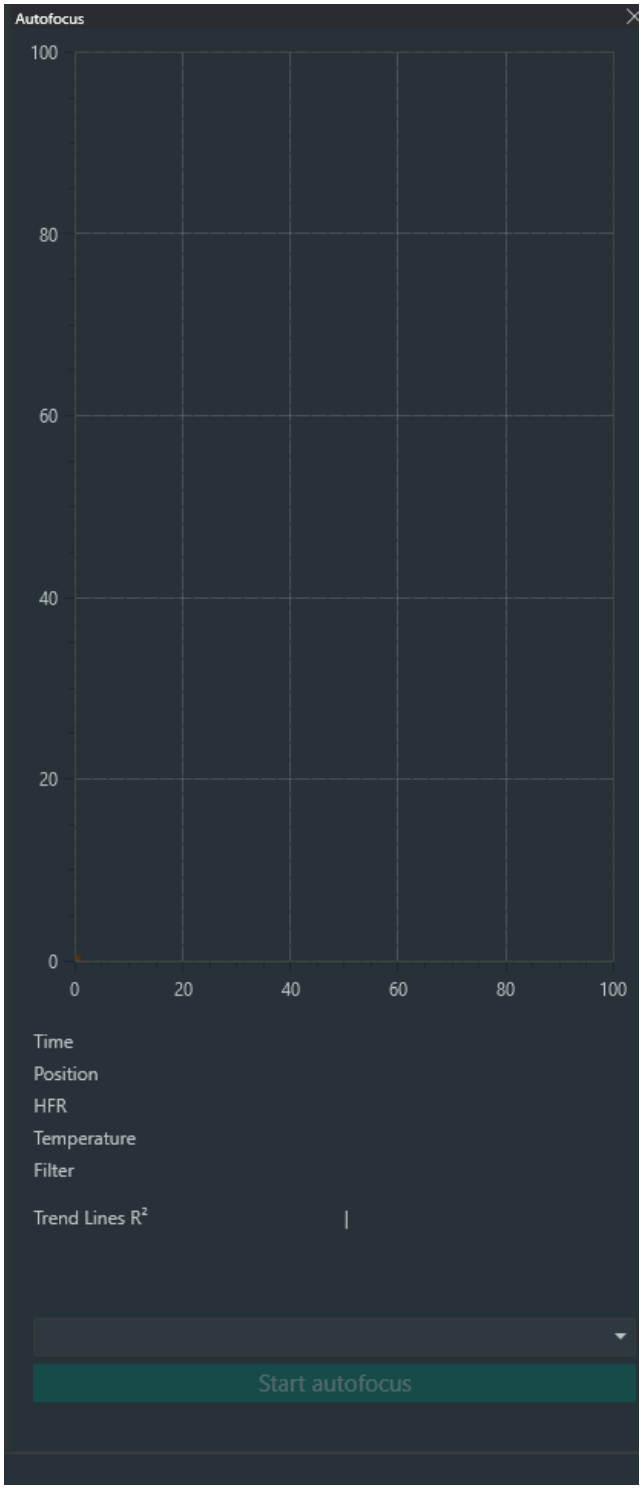


Figure 4-6NINA autofocus interface.

During autofocus, NINA will:

- Capture star images at each focus position.

- Measure the HFR (Half Flux Radius) for each position.
- Plot a focus curve using the HFR values.
- Calculate the optimal focus position based on the fitted curve.

4. Focus Curve Generation and Analysis

During the autofocus process:

•NINA captures images at each focus point, calculates the **Half Flux Radius (HFR)** for each point, and plots a focus curve.

•If the backlash compensation value is too small, the initial section of the curve may appear as a flat line, which can lead to autofocus failure. In such cases, increase the backlash compensation value and rerun the autofocus process.

•To measure the actual backlash of your equipment:

1.Set the backlash compensation value to **0**.

2.Run the autofocus process.

3.The flat section of the focus curve corresponds to the actual backlash value in steps.

A successful focus curve is shown in Figure 4-7.

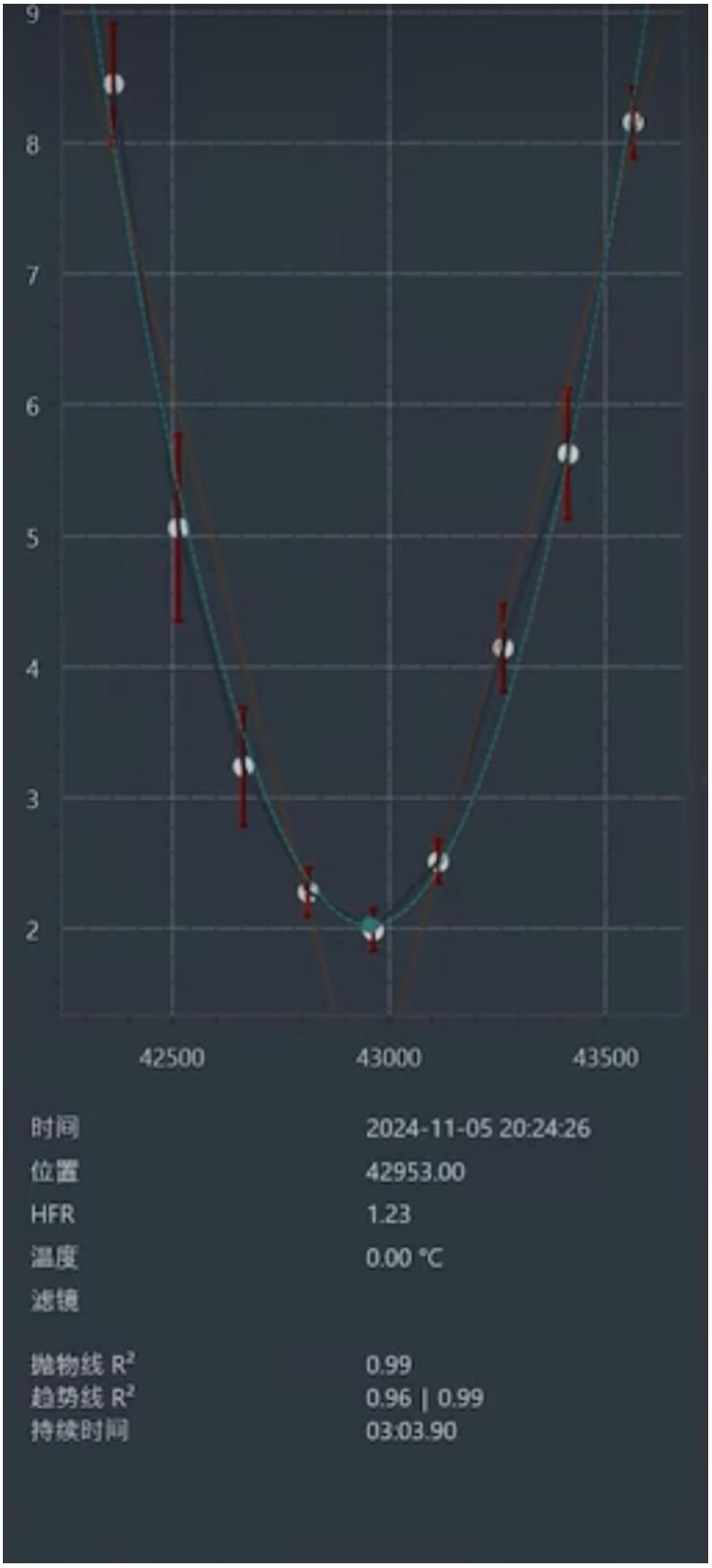


Figure 4-7 successful focus curve in NINA.

5. Automatically Triggering Autofocus in Sequences

NINA supports automatic triggering of autofocus during imaging sequences:

1.Configure autofocus-related settings in the **"Sequence"** tab.

2.Once configured, NINA will run autofocus automatically based on time intervals or temperature changes specified in the sequence settings.

For detailed instructions on configuring sequences, refer to the official NINA documentation.

4.4.2 Sequence Generator Pro Autofocus Guide

This section explains how to use the AAF for autofocus in Sequence Generator Pro (SGP). The process includes preparation, parameter configuration, and executing autofocus.

1. Preparation

Before starting autofocus, ensure the following preparatory steps are completed:

1.**Device Connection**:

Properly connect the camera, AAF, and telescope. Also, activate the equatorial mount's tracking function.

2.**Initial Manual Focus**:

Adjust the telescope to a position near focus:

- **Method 1**: Set the ToupTek AAF to its outermost position, then manually rotate the focusing knob while observing star images until they appear near focus.
- **Method 2**: Set the ToupTek AAF to its initial focus position. Send fine movement commands and observe the star images to determine the approximate focus point.

Note: The autofocus function is designed for fine-tuning and maintaining optimal focus. It cannot automatically correct from a completely defocused state. Therefore, a preliminary manual focus is necessary.

2. Configuring Autofocus Parameters

1.Open the **Equipment Profile Manager** by selecting **"Tools → Equipment Profile Manager"** from the menu.

2.In the pop-up dialog, select the profile you want to edit and go to the **"Focus"** tab.

3.In the **"Focuser"** dropdown menu, select **"ToupTek AAF"** and enable the **"Use Auto Focus"** option.

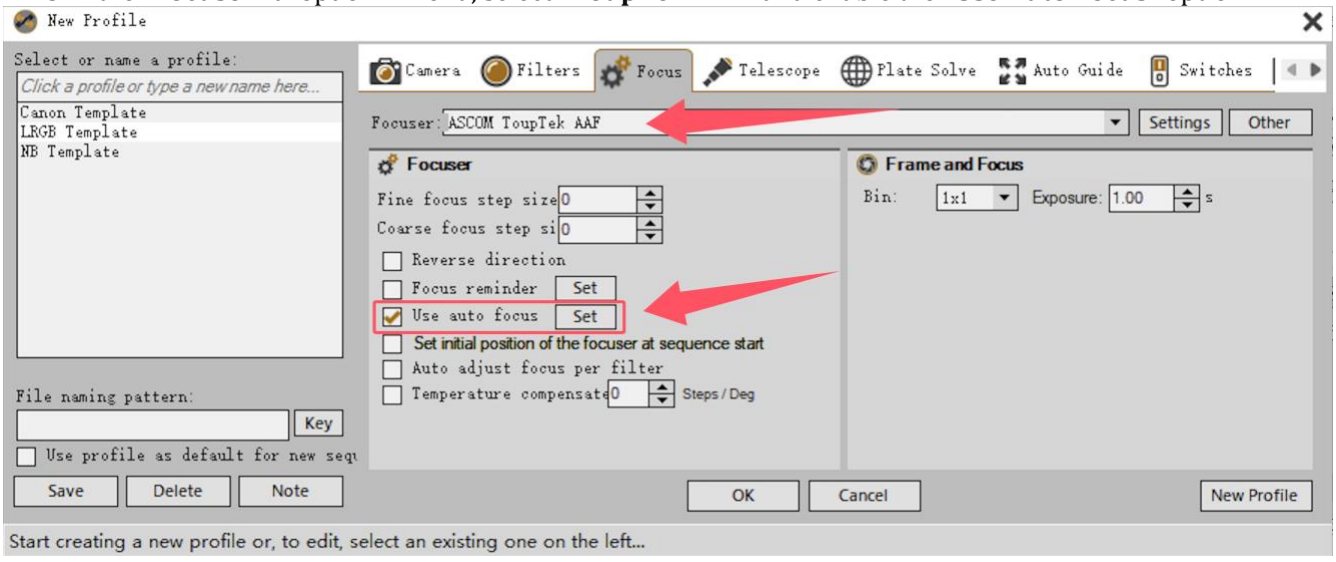


Figure 4-8 Focus tab in the Equipment Profile Manager showing how to select the focuser and enable autofocus.

4.Click the **"Set"** button next to the **"Use Auto Focus"** option to open the autofocus settings dialog. Configure the following key parameters:

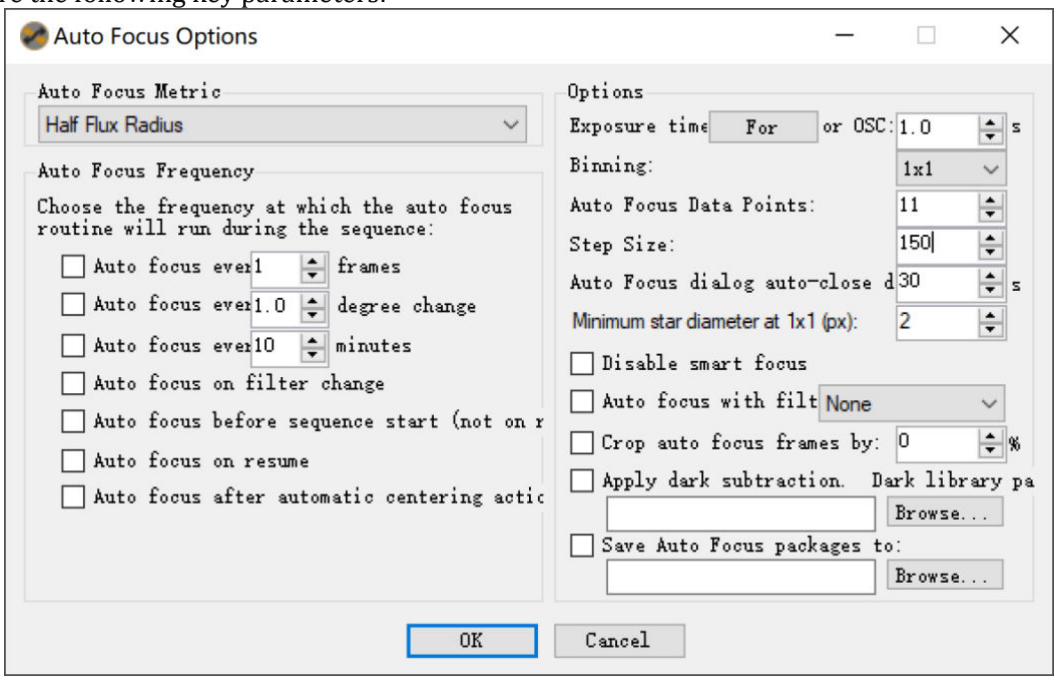


Figure 4-9 Autofocus settings interface

- **Auto Focus Metric**: Select **"Half Flux Radius (HFR)"**, the recommended metric for astrophotography.
- **Auto Focus Data Points**: Define the number of focus points on the curve. Too few points reduce accuracy, while too many may lead to failure. Choose an appropriate number based on your equipment.
- **Step Size**: Define the step size between focus points. For example, for the **SkyRover 102 APO Pro**, a step size of **150 steps** (~0.12mm) is recommended. Adjust this based on the shape of the focus curve:
  •If the curve is too flat, increase the step size.
  •If the curve is too steep, decrease the step size.

3. Backlash Compensation Settings

1.In the **"Focus"** tab, click the **"Other"** button to access advanced settings.

2.Enable the **"Focuser Backlash Compensation"** option and configure the following parameters:

•**Compensation Direction**: Choose the appropriate direction (IN or OUT) based on your telescope's characteristics.

•**Compensation Step Size**: Input a value slightly larger than the measured backlash. For example, if the measured backlash is **300-400 steps**, set the compensation value to **500 steps**.

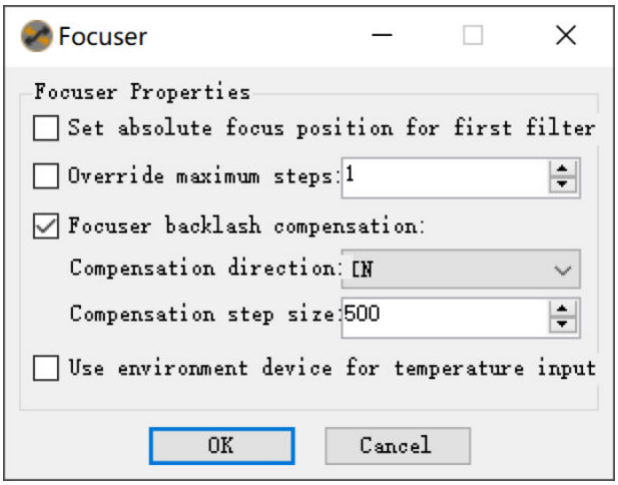


Figure 4-10 Advanced settings interface for backlash compensation.

3.Disable the built-in backlash compensation of the AAF by setting the **"Backlash"** parameter to **0** in the ASCOM driver settings.

4. Executing Autofocus

1.Click the **"Run"** button to start the autofocus process.

2.During the autofocus process:

- The software will capture star images based on the specified **Auto Focus Data Points**.
- After capturing each image, the AAF will move by the configured **Step Size** and repeat the process.
- A focus curve will be plotted using the HFR values, and the optimal focus position will be calculated based on the curve.

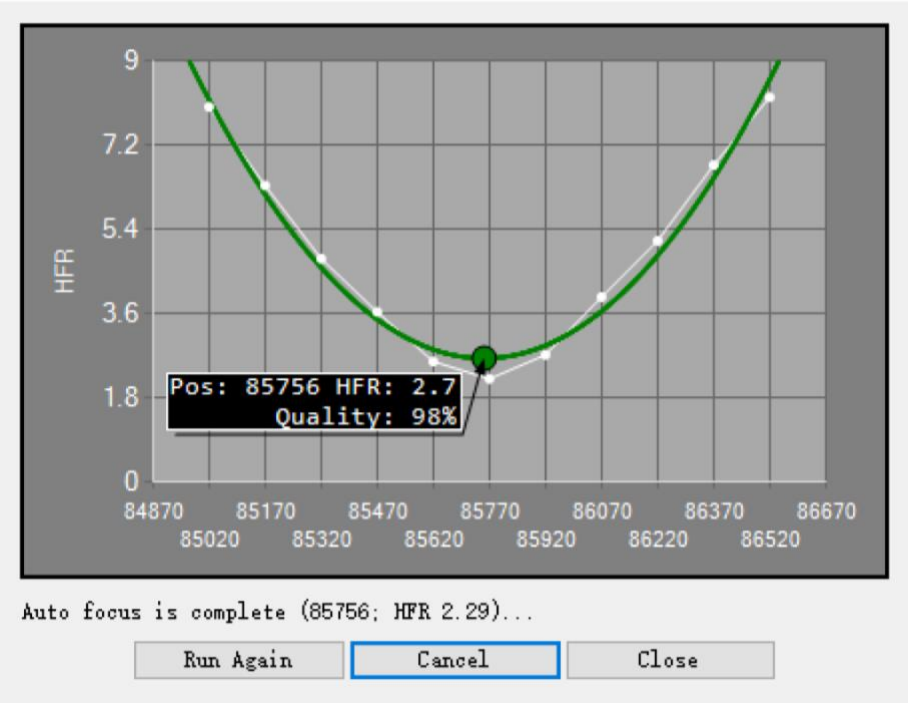


Figure 4-11 Autofocus execution interface showing the focus curve.

Note: If the focus curve starts with a flat section, it usually indicates insufficient backlash compensation. Increase the backlash compensation value and rerun the autofocus routine until the flat section disappears.

5.Saving and Adjusting Settings

1.**Automatic Save**: Once the **Equipment Profile Manager** settings are completed, they will be automatically saved and applied to future sequences.

2.**Real-Time Adjustments**: During imaging, use the **Focus Control** interface to modify parameters. These adjustments only affect the current sequence.

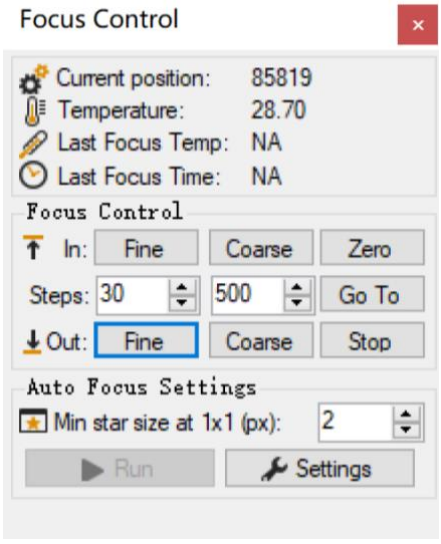


Figure 4-12 Interface for adjusting focus parameters in real time.

6. Common Issues and Solutions

•**Autofocus Failure**: Ensure the initial manual focus is close to optimal and verify that backlash compensation is configured correctly.

•**Abnormal Focus Curve**: Adjust the step size or the number of focus points to improve accuracy.

5 Service

We provide a **2-year warranty** for this product.

- During the 2-year warranty period, we offer free after-sales repair services if the focuser fails to function properly.
- After the 2-year warranty period, we offer **lifetime repair services**, charging only for the parts that need replacement or repair.

Warranty Exclusions:
The warranty does not cover damage caused by misuse, abuse, accidental drops, or issues arising from transportation or improper handling.
Return Shipping:
The buyer is responsible for the shipping costs when returning the focuser for repair.
Driver Updates:
For driver updates, please visit the “Downloads” section on our official website:
www.touptek-astro.com/downloads
For customers who purchased the product through a distributor, please contact the distributor for more information.
If you need technical support, please reach out to the store where you purchased the product.

6 Revision History

Date	Version	Page	Revised Content